Azimuthal and rapidity correlations of large p_t particles in Pb+Pb collisions at the SPS

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The question of particle production in the region of transverse momentum 1–4 GeV/c is very important for understanding the physics of nuclear collisions. The relative production of particles with such transverse momentum is increasing with beam energy, and is expected to be the dominant particle production mechanism at RHIC. How are particles in this region of transverse momentum produced? By hard scatterings, or is their high p_t due to developed transverse flow? At SPS energies, single particle spectra are described quite well by both models and do not discriminate between them[1, 2]. To address this question in more detail two particle correlations[2, 3] in rapidity and azimuthal angle are analyzed using NA49 minimum bias data, selecting particles with transverse momentum higher than 1 GeV/c. We use the following definition for the correlation function

$$R_2(y_1,\phi_1,y_2,\phi_2) = \frac{\frac{d^4n_{1,2}}{dy_1 d\phi_1 dy_2 d\phi_2}}{\frac{d^2n_2}{dy_1 d\phi_1}\frac{d^2n_2}{dy_2 d\phi_2}}. \qquad (1)$$

The (absolutely normalized) correlation function $R_2(\Delta\phi)$ for particles of transverse momentum $p_t > 1.2$ GeV/c is presented in Fig. 1. The correlation function presented is averaged over rapidities of both particles.

The correlation dependence on the particle transverse momenta, on the centrality of the collision, as well as on the angle of the emission with respect to the reaction plane is being studied.

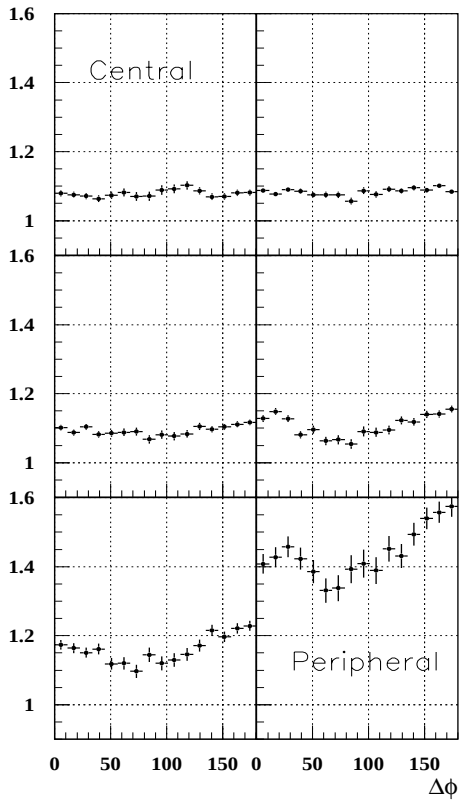

Figure 1: Correlation function $R_2(\Delta\phi)$ for different centralities; transverse momentum of both particles $p_t > 1.2$ GeV/c.

References

[1] WA98 Collaboration, M.M. Aggarwal et al., Phys. Rev. Lett., 81 (1998) 4087.

[2] X.-N. Wang, Phys. Rev. Lett., 77 (1998) 2655.

[3] X.-N. Wang, Phys. Rev. D47 (1993) 2754.